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GB 1353321
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GB 1190463
GB 1180219
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GB 580063
GB 515465
GB 394442
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(54) **Thermoluminescent dosimeter**

(57) A dosimeter of the type in which two plates of plastics material are bonded together with a layer of thermoluminescent material trapped between is made by sprinkling granular thermoluminescent material over areas (10A, 11A) of a plastics plate which has adhesive on it, removing excess material and then applying a second layer of plastics material over the first layer, and over the thermoluminescent material, and bonding it to complete the dosimeter.

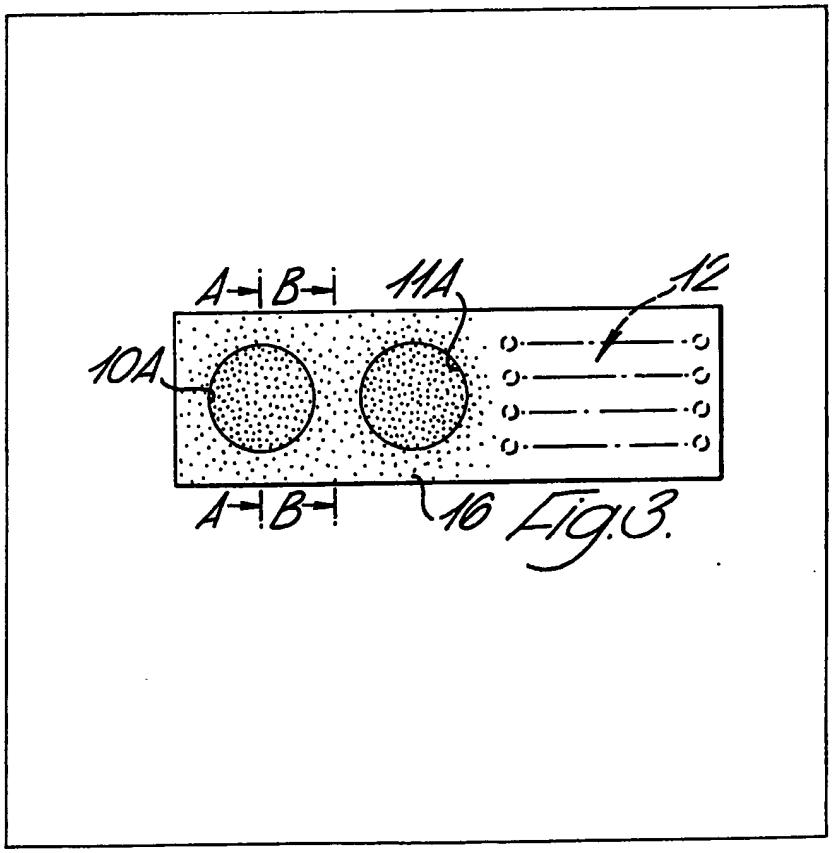

Fig.3.

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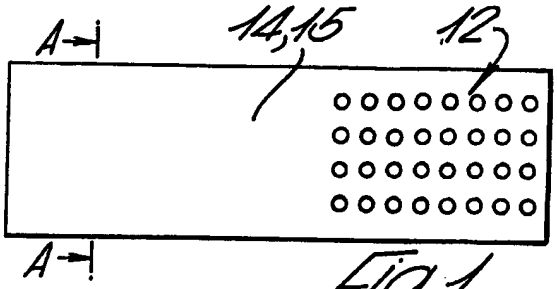

Fig.1.

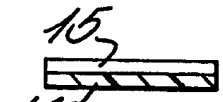

Fig.1A.

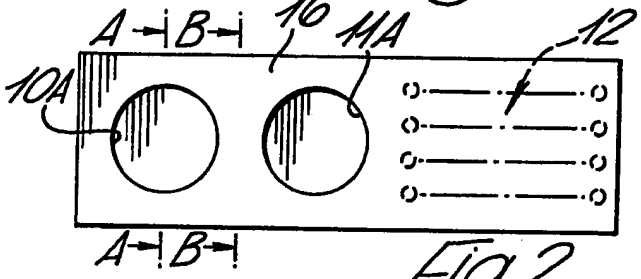

Fig.2.

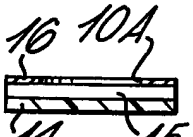

Fig.2A.

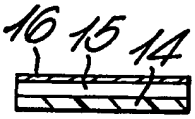

Fig.2B.

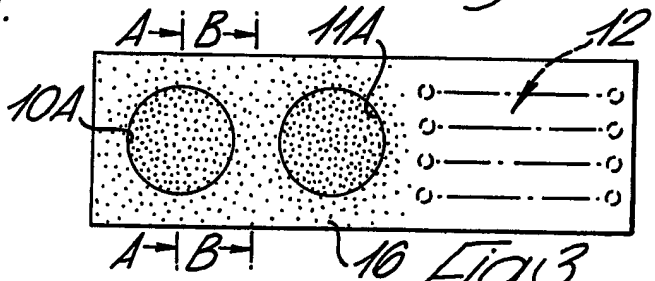

Fig.3.

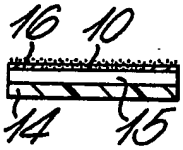

Fig.3A

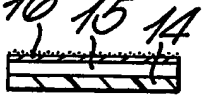

Fig.3B.

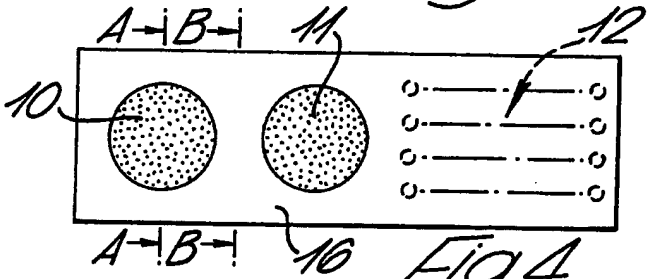

Fig.4.

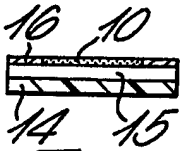

Fig.4A.

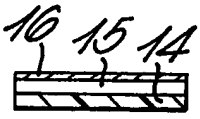

Fig.4B.

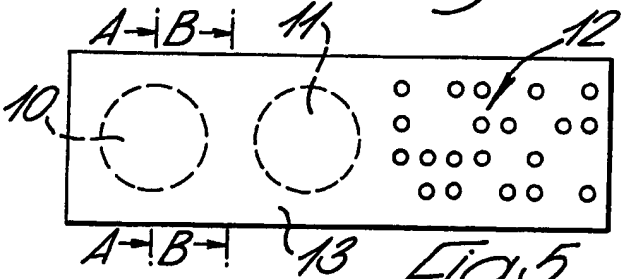

Fig.5.

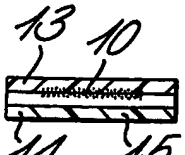

Fig.5A.

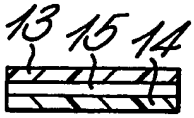

Fig.5B.

SPECIFICATION

Thermoluminescent dosimeter

This invention relates to thermoluminescent dosimeter. In our published Patent 1,471,893 thermoluminescent dosimeters are described in which plastic plate materials are thermally bonded together with layers of thermoluminescent material in between the plastic layers, the whole being thermally bonded so as to retain the thermoluminescent material within the dosimeter. The method described in that patent involved providing a measured quantity of granular thermoluminescent material and applying it over a predetermined area on a first thermoplastic plate and then thermally bonding a second plastic plate over the first one to fix the position of the thermoluminescent material.

Although the dosimeter described in that patent was a useful instrument, we have found a much improved way of applying the thermoluminescent material and retaining it.

In accordance with the present invention a thermoluminscent dosimeter is made by applying an adhesive to a layer of plastic material, sprinkling granular thermoluminscent material over the area where the adhesive is applied, removing excess thermoluminescent material. A second layer of plastic material may then be applied over the first layer, and over the granular thermoluminescent material, to form the dosimeter.

In one method according to the invention an area of a thermoplastic plate which forms the base of the dosimeter has a mask applied to it leaving free areas which are coated with adhesive, the thermoluminescent material is then sprinkled on those areas, the excess material is blown clear and then the mask is removed. The plate with the thermoluminescent material applied to it may then be joined to a second plate either by adhesive or by other methods.

In accordance with another method the whole of the area of the plate is coated with the adhesive, the adhesive is then covered with a layer of paper or other tape leaving holes in the paper or tape where it is desired to apply the thermoluminescent material and then the thermoluminescent material is sprinkled on the areas coated with adhesive, the excess removed, and the dosimeter completed by removing the tape or paper and using the remaining adhesive to hold a second layer of thermoplastic material on top of the first thus trapping the thermoluminescent material in between.

In the accompanying drawings:-

Figures 1 to *5* illustrate steps in the manufacture of a dosimeter in accordance with the invention;

Figure 1 is a plan view of the Teflon (Registered Trade Mark) layer on a Kapton layer which together form the base of the dosimeter;

Figure 1A is a section on line AA shown in Figure 1,

Figure 2 shows the same base but with a masking tape applied to the base leaving areas clear for applying thermoluminescent material;

Figures 2A and *2B* are sections respectively on lines AA and BB of Figure 2;

Figure 3 shows the same base as is shown in Figure 2 with the thermoluminescent material sprinkled on it;

Figures 3A and *3B* are respectively sections on lines AA and BB of Figure 3;

Figure 4 shows the same base with excess thermoluminescent material removed from it;

Figures 4A and *4B* are respectively sections on lines AA and BB of Figure 4;

Figure 5 shows the finished dosimeter and

Figures 5A and *5B* are sections respectively on lines AA and BB of Figure 5.

In Figure 5 of the accompanying drawings the completed dosimeter is shown and it will first be described. Basically, the dosimeter shown in Figure 5 comprises two separate dosimeters 10 and 11 and a coded portion 12. The dosimeters and coded portion are constructed as a laminate which includes, for example, an upper PTFE layer 13 which is 0.1 millimeters thick and a lower type F Kapton layer 14 on which is a 0.1 millimeter thickness Teflon FEP coating. The thermoluminescent material of dosimeters 14 and 15 can for example by activated lithium borate or lithium fluoride, applied in granular form. For example there may be 20 milligrams in a circle of 10 millimeters diameter. The overall dimensions of the dosimeter can be two inches long and 0.6 inches wide.

The dosimeter may be constructed to be flexible with a sticky tab to allow it to be stuck on to the finger or to a wrist in ring form and can thus be used for extremity monitoring.

One side of the dosimeter can be made of PTFE or Kapton loaded with carbon to give a black material suitable for direct heating using an infra red beam.

In manufacturing the dosimeter initially the layer of Kapton 14 and layer of Teflon 15 are joined together to form the base of the dosimeter. It is provided with a coded portion 12 as described in our Patent Specification 1,471,893. The upper surface of layer 15 is then coated with an adhesive such as temperature-stable silicone material for example 3M type No. 467 manufactured by the Minnesota Manufacturing and Mining Company.

As shown in Figure 2 and in the sections of Figures 2A and 2B the layer of Teflon is then covered with a layer 16 of paper or other masking material such as masking tape in which there are two apertures 10A and 11A to form the areas in which it is required to have thermoluminescent material to form the dosimeters.

Alternatively, the adhesive may be applied by pressing the tape to be coated against a "carrier tape". This can be paper or other tape with adhesive coating. The adhesive may be masked or the paper backing cut to allow coating of selected areas with adhesive. The selected areas of adhesive being transferred as the carrier and the tape to be coated are pressed together.

The thermoluminescent material such as phosphor in granular form, is then sprinkled onto the layer of paper or masking tape 16, or the base may be dipped into the granular material, and the granules stick to the adhesive coated areas which are unmasked. i.e. areas 10A and 11A. Some granules will spread

around on the masked area as shown in Figure 3. The excess granular material is removed as shown in Figure 4 by blowing or shaking or brushing or in any other way. A1 shown in Figure 5 the masking tape is removed and a further layer 13 of PTFE may be stuck on to the layer 15 to complete the assembly. It is found that a predetermined quantity of granular material remains adhering to the adhesive areas and this quantity can be reproduced time after time.

By selection of the size of the granules and of the area a predetermined quantity of thermoluminescent material to a predetermined thickness can be applied.

The whole base area may be covered with adhesive initially and the masking tape applied over the whole base area leaving exposed areas of adhesive where there are apertures in the masking tape. The granular thermoluminescent material is then applied as described above, the excess material removed, and the masking tape then removed. When the masking tape is removed the upper plastic layer may be stuck to the lower base layer using the remaining adhesive.

CLAIMS

1. A method of making a thermoluminescent dosimeter comprising applying an adhesive to a layer of material, sprinkling granular thermoluminscent material over the area where the adhesive is applied, removing excess thermoluminescent material.

2. A method according to claim 1 and in which an area of the plastic material which forms the base of the dosimeter has a mask applied to it leaving free areas which are coated with said adhesive, the thermoluminescent material then being sprinkled on those areas, the excess material is blown clear, and the mask is removed.

3. A method according to claim 1 or claim 2 and including layer of plastic material over the first layer and over the granular thermoluminescent material to form the dosimeter.

4. A method according to claim 1 and in which the whole of the area of the plate is coated with the adhesive, the adhesive is then covered with a layer of paper or other tape leaving holes in the paper or tape where it is desired to apply the thermoluminescent material and then the thermoluminescent material is sprinkled on the areas coated with adhesive, the excess removed, and the dosimeter completed by removing the tape or paper and using the remaining adhesive to hold a second layer of thermoplastic material on top of the first thus trapping the thermoluminescent material in between.

5. A method according to any of claims 1 to 4 in which the adhesive used is a temperature - stable silicone material.

6. A method according to any preceding claim and in which the adhesive is silicone polymer adhesive 3M Type No. 467.

7. A method according to any preceding claim and in which one side of the dosimeter if of plastic material lower with carbon to give a black material suitable for use with infra red heating.

8. A dosimeter manufactured by the method of any of claims 1 to 7.

9. A method of manufacturing a dosimeter substantially as hereinbefore particularly described and as illustrated in the accompanying drawings.

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